

# INFORMATION SECURITY USING PHASE SHIFT DIGITAL HOLOGRAPHY

## ABSTRACT OF THE INVENTION

5 A method and system for encrypting multi-dimensional information utilizing  
digital holography is presented. A phase-shifting interferometer records the phase and  
amplitude information generated by a three-dimensional object at a plane located in  
the Fresnel diffraction region with an intensity-recording device. Encryption is  
performed by utilizing the Fresnel diffraction pattern of a random phase mask. Images  
of different perspectives of the three-dimensional object focused at different planes  
10 can be generated digital or optically with the proper key after decryption.

After decryption, images of the object, focused at different planes, can be  
generated digitally or optically. The method allows for the reconstruction of the  
object with different perspectives from a single encrypted image. The method does  
not require sending the key exclusively through a digital communication channel.  
15 Instead, a copy of the random phase key itself can be sent to the authorized user.

A method of forming an image of an object is disclosed. The method  
comprises forming an original hologram of the object; compressing the original  
hologram of the object to form a compressed hologram; decompressing the  
compressed hologram of the object to form a decompressed hologram; and  
20 reconstructing the object from the decompressed hologram to form a multi-  
dimensional image of the object.